



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 2450
Alexandria, Virginia 22303-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10 098,706 | 03 15 2002 | Rama L. Hegde | SC116971P | 2984 |

23125 7590 07 10 2003

MOTOROLA INC
AUSTIN INTELLECTUAL PROPERTY
LAW SECTION
7700 WEST PARMER LANE MD: TX32/PL02
AUSTIN, TX 78729

EXAMINER

SARKAR, ASOK K

ART UNIT PAPER NUMBER

2829

DATE MAILED: 07/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/098,706

Applicant(s)

HEGDE ET AL.

Examiner

Asok K. Sarkar

Art Unit

2829

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,9,26,27 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,9,26,27 and 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1 – 3, 9, 26, 27 and 29 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

3. Claims 1 – 3, 9, 26, 27 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The use of the term adjacent may also mean the layers are side by side although the figures show them to be a stack. The use of an indefinite term renders the claims indefinite. For the examination purpose, the adjacent was considered to be over.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 – 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halliyal, US 6,451,641 or Ballantine, US 6,444,592 or Haukka, US 2002/0115252 in view of Shinriki, US 5,292,673.

Regarding these claims Halliyal teaches a transistor device 100 in which the gate

Art Unit: 2829

dielectric 108 is present between the semiconductor substrate 102 and the gate electrode 110 (see Fig. 1) in which HfO_2 (first layer) and ZrO_2 (second layer) and other dielectric layer (third layer) are used as multiple layers (see column 6, line 37 and column 7, lines 3 – 7).

Ballantine teaches transistor device with gate dielectric layer 14 between gate electrode and the substrate in which HfO_2 (first layer) and ZrO_2 (second layer) and other dielectric layer (third layer) are used as multilayers (see column 4, lines 20 – 23).

Haukka teaches transistor device with gate dielectric layer 14 between gate electrode and the substrate in which HfO_2 (first layer) and ZrO_2 (second layer) and other dielectric layer (third layer) are used as multilayers (see paragraphs 25, 27 and 56).

Halliyal or Ballantine or Haukka teaches the formation of high – k dielectric materials which can be formed by combining or using composite materials but fails to teach that HfO_2 is adjacent to the gate electrode and ZrO_2 is adjacent to the semiconductor substrate.

Shinriki teaches that these high – k materials can be used either in stack or mixture to obtain the similar effect of other high – k materials in between column 8, line 66 and column 9, line 5.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Halliyal or Ballantine or Haukka by using a layered dielectric of HfO_2 and ZrO_2 in which HfO_2 is adjacent to the gate electrode and ZrO_2 is adjacent to the semiconductor substrate since Shinriki teaches that the same high – k effect can be obtained irrespective of using them in layers or in mixtures and therefore

Art Unit: 2829

will provide the designed high dielectric constant and excellent mobility and can therefore be used in the order in which HfO_2 is adjacent to the gate electrode and ZrO_2 is adjacent to the semiconductor substrate.

6. Claims 26, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinriki, US 5,292,673 and Haukka, US 2002/0115252.

Regarding claimd 26 and 27, Shinriki teaches a transistor device comprising a semiconductor substrate 1 having a source and drain 6 and a channel between the source and the drain; a gate electrode 5 over the channel and a gate dielectric 4 with respect to Fig. 5.

Shinriki teaches that gate dielectric can consist of HfO_2 , ZrO_2 and other oxide can be used either in stack or mixture to obtain the similar effect of other high – k materials in between column 8, line 66 and column 9, line 5.

Haukka teaches transistor device with gate dielectric layer 14 between gate electrode and the substrate in which HfO_2 (first layer) and ZrO_2 (second layer) and other dielectric layer (third layer) are used as multilayers (see paragraphs 25, 27 and 56). See also Figs. 3 and 4.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to use a layered dielectric of HfO_2 and ZrO_2 since Shinriki teaches that the same high – k effect can be obtained irrespective of using them in layers or in mixtures and therefore will provide the designed high dielectric constant and excellent mobility and a third layer such as Al_2O_3 can be used to provide diffusion barrier properties as taught by Haukka.

Art Unit: 2829

Regarding claim 29, Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hira*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

Additionally, Haukka teaches depositing ZrO_2 by the ALD process (see abstract, also see paragraph 97).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

Art Unit: 2829

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 703 308 2521. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 703 308 1233. The fax phone numbers for the organization where this application or proceeding is assigned are 703 308 7722 for regular communications and 703 308 7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 4918.

Asok K. Sarkar
June 26, 2003

